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ABSTRACT

This study compared the creative thinking areas of flexibility and fluency of fifth grade Japanese and American children. A new instrument for cross-cultural settings, consisting of ten flexibility items and six fluency items, was constructed and administered to fifth graders. The results indicated that there were no differences in fluency between the 73 Japanese and 41 American children, but American children scored higher in flexibility than did Japanese children. No gender difference for either creative thinking area was found. A list of seven references is included. (BC)

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Differences in Creative Thinking between Japanese and American Fifth Grade Children

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Abstract

This study was conducted comparing the creative thinking areas of flexibility and fluency of fifth grade Japanese and American children. A new simple instrument for cross-cultural settings, consisting of a set of ten flexibility items and six fluency ones, was constructed and administered to the 73 Japanese and the 41 American fifth graders. The results indicated that there were no differences noted in fluency between the two, but that American children scored higher in flexibility. No difference was found between gender in each creative thinking area.

Introduction

Educational policies of many countries have as one of the major goals of education, in general, and of science education, in particular, the creative development of the children. How to accomplish this expeditiously and efficiently remains an unsolved problem. For example, among recent educational reform movements, the *National Council on Educational Reform* in Japan presented its "Fourth Report on Educational Reform" in 1987. The Report points out in the section on "Enrichment and Reform of Elementary and Secondary Education" that:

> Children should fully acquire the basic and essential knowledge and skills necessary for cultivating a sound basis for character formation throughout life..... Emphasis should be placed on the following: Fostering creativity, judgment, ability to think, and the power of expression;.... (p. 47)

This policy came from the prevailing notion by the Japanese that the Japanese are good at imitating things originally invented by other people but poor at inventing things on their own. The Japanese think that education should be responsible for the cultivation of creativity of subsequent generations of children. This responsibility raises several questions among which are: What is creativity? And, indeed are the Japanese children

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less creative than children of other countries? In order to gain some insights into the latter question this study aims at investigating if there are any differences in creativity between Japanese fifth grade children and American fifth grade children.

Creativity has been studied by many researchers approaching the topic from various viewpoints. The concept of creativity and the factors of creativity, however, have not been the same among researchers. For example, Guilford (1959) extracted the following factors: Sensitivity (to problem), Fluency, Originality, Flexibility, Elaboration and Redefinition, and the factors indicated by Torrance (1966) were Fluency, Flexibility, Originality, and Elaboration. Among the factors most of the researchers proposed, however, the "Fluency" and "Flexibility" factors of creative thinking are commonly found. In the present study, therefore, it was decided that creativity should be measured in terms of the fluency and the flexibility factors of creative thinking.

Method

Instrument

The present study aimed at surveying Japanese and American 5th graders' creativity in terms of flexibility and fluency factors. Since this study was a cross-cultural one, we must consider what kind of instrument was appropriate for the need. One of the most important points is that the instrument for a cross-cultural setting must be simple for the data analysts as well as for the subjects, because cultural biases should be avoided as far as possible. Unfortunately, we could not find any existing instruments which were, from the start, developed for the cross-cultural study and were so simple and culturally unbiased. We needed a new instrument. We adopted the style of verbal "Utility Test" which is commonly found among several existing instruments (Guilford 1959, Getzels and Jackson 1962, Torrance 1966, Koseki 1981).

The new instrument consisted of sixteen items; Ten were flexibility items and six were fluency items. Each of the flexibility items presented an unlabeled object, for example, a door key or a rubber band and the children were instructed to list possible uses for this object. The fluency items presented an obscure figure(s). The children were instructed to list as many possibilities as they could for what these objects might be. The flexibility item set was identified as the Flexibility Test. The fluency item set was identified as the Fluency Test.

For the Japanese subjects, one of the authors (Ogawa) translated and constructed the test instrument into Japanese. The readability of the Japanese version were checked by several Japanese science educators and Japanese prospective science teachers. The responses of the Japanese subjects were also translated into English by Ogawa and the analysis was made based on the English version of the responses.

Sample

The sample consisted of 114 fifth graders from four elementary classes. Two were

selected from one average, Japanese co-educational elementary school located in a rural part of Japan. The other two classes were selected from one average, American co-educational elementary school located in a rural part of the southeastern United States. The Japanese sample consisted of 35 boys and 38 girls. The American counterpart consisted of 17 boys and 24 girls.

Data Analysis

Established categories of response for each item were not prepared. Such categories seem to be valid for the mono-cultural settings in which the instrument was developed. It was possible however, that the same responses to a certain item would have different meanings in different cultural contexts. In the cross-cultural setting like the present study, a more primitive and simpler principle for analysis was needed. We adopted, therefore, the following analytical procedures. The meaningfulness of the original response data sets from the Japanese subjects and from the American subjects was examined by Ogawa and by DeVito, respectively because we thought that the researcher having the same cultural background as that of the subjects should analyze the data.

The meaningful responses of a subject to each item were identified and simply counted and the number of responses of each of subjects to each item were transformed to the standardized score with a mean of 50 and a standard deviation of 10 (T-transformation procedure). The reliabilities of the present instrument shown in Table 1 clearly satisfied the level of the reliable test.

Table 1. Alpha coefficients of the instrument.

Test	Gender	Japanese	American	Total
Flexibility Test	M	0.930	0.918	
	F	0.832	0.897	
	T	0.891	0.905	0.904
Fluency Test	M	0.805	0.959	
	F	0.837	0.847	
	T	0.818	0.906	0.843

Results

The mean scores and standard deviations for Japanese and American fifth graders for the tests are shown in Table 2. Since our sample size was not so large, the Bartlett tests for homogeneity of variances (Winer 1962) were performed before the analyses of variance. In the two tests there were no significant differences among variances concerned. Therefore, 2×2 (nationality × gender) ANOVA which allows for unequal numbers in the cells (Winer, 1962) was performed for each test. Significant differences in the flexibility ($F(1,110) = 13.82$, $p<0.01$) between the Japanese and the American were

found, but there was no significant difference in the fluency. The results were summa-

Table 2. Mean scores and standard deviations for the tests.

Test		Japanese		American	
		M	F	M	F
Flexibility Test	N	35	38	17	24
	Mean	47.91	48.35	53.68	52.92
	S.D.	7.621	5.773	8.520	6.264
Fluency Test	Mean	50.86	49.96	48.60	49.65
	S.D.	8.347	7.174	7.697	6.039

rized as follows:

(1) The flexibility of American fifth graders was higher than that of Japanese counterparts, but there was no difference in flexibility between boys and girls.

(2) In the fluency there were no differences between the two nationalities and between gender.

Table 3. Correlation coefficients between Flexibility and Fluency Tests.

Gender	Japanese	American	Total
Male	0.614	0.841	0.602
Female	0.480	0.742	0.532
Total	0.556	0.787	0.572

Table 3 shows the correlation coefficients between the Flexibility Test scores and the Fluency Test scores. Of course, all the coefficients being high indicate that the flexibility and the fluency were significantly related to each other. Among them, there was a significant difference of coefficients between the Japanese and the Americans (χ^2=4.636, df=1, $p<0.05$), indicating that the flexibility was more closely related to the fluency in the Americans than in the Japanese. No significant difference of coefficients, however, was found between boys and girls (χ^2=0.262, df=1, NS).

Since the scores were standardized with the mean of 50 and the standard deviation of 10, the flexibility and the fluency of the subjects can be compared to each other. According to the scores of each test, we classified the subjects into three groups; Higher score group (above 60), Medium score group (60 - 40), and Lower score group (below 40). Table 4 shows the contingency table for subject classifications in each test. The likelihood ratio tests for the three-variate (group, gender, and nationality) log-linear modeling (Whiteley 1983) were performed using the contingency tables of two tests, respectively. In the Flexibility Test the accepted model contained not only the group and nationality effects (Ranges of the effect are 14.2 and 8.10, respectively.) but also their interaction effect (Range of the effect is 15.8.) as the main effect (G^2=3.45, df=6). Flexibility of the higher score group was more prevalent among the American subjects

Table 4. Contingency tables for subject classification.
(Figures indicate numbers of the subjects)

Test	Group	Japanese		American	
		M	F	M	F
Flexibility Test	Higher score group	3	3	5	3
	Medium score group	29	33	12	21
	Lower score group	3	2	0	0
Fluency Test	Higher score group	6	4	1	3
	Medium score group	26	33	13	20
	Lower score group	3	1	3	1

than the Japanese subjects, and no American subjects were found in the lower score group. This means that the frequency of the American 5th graders with high flexibility was higher than that of the Japanese counterparts. No gender effect was found. On the other hand, in the Fluency Test, the accepted model contained only the group and nationality effects (G^2=6.87, df=8). In this case, the group effect was found to be the main effect (Range of the effect is 2.44.) and the nationality effect, not a strong one (Range of the effect is 0.576.), contributed significantly to the distribution of the subjects. This suggests that there were some differences of subject distribution to the three groups between two nations. However, there were no effect of gender, either.

Discussion

The present results suggest interesting points with regard to the creativity of the Japanese and American children. There was no difference in the fluency of ideas between the two nationalities. However, creativity in terms of the flexibility of ideas produced by 5th graders was significantly different. The American children were superior to the Japanese children in flexibility, and furthermore, none of the American children were found in the lower score group in the Flexibility Test. Why are Japanese children inferior to Americans in the flexibility field? This is a serious issue for the Japanese science educators. The present results, as a whole, suggest that Japanese children seem apt to accept a certain object, for example a door key, as that which is presented to them ("This is a door key."). Once they accept this label, they adhere to its original usage. We suppose that this comes, at least partially, from the Japanese children's daily lives. They have had few experiences of playing with junk or making some toys with something like a jackknife. They never think of making their own toys, but ask their parents to buy finished toys they want to have. Parents readily give them such toys. This style is often seen even in science classes. Teachers, for example, provide all of the pupils with the same kind of batteries, battery holders, and bulb kits before teaching the electric circuitry lesson. The children have no chance to collect several types of batteries and bulbs or make their own battery holders. Perhaps this curtailment inhibits creativity even dur-

ing their science classes.

By contrast American children generally have more latitude to operate on their own. In fact it is encouraged. American children are exposed to a greater variety of heterogeneity in its people, its religions, its entertainment, its sports, foods, etc. The general character of the "independent" American seems to be a desired trait. Children in American schools and homes are recognized and rewarded for creative, innovative, independent thinking. While it does not happen as often as it should, when it does, the child is applauded. Elementary science programs are replete with magical words like inquiry, discover, search for solutions, and probe and question. Existing science programs foster independent, creative thinking. Teacher preparation programs and the public school educational curriculum allow for diversity within the parameters of what is termed "the norm".

The Japanese science educators must become more aware of the characteristics of Japanese children's creativity. There is an emergent need to develop more systematic research projects on this issue. The outcomes of such prospective projects can suggest ways to cultivate Japanese children's creativity.

Another interesting finding is that there is no difference in responses between genders. But, notice must be taken, this does not necessarily mean boys' responses to any item are the same as those of girls. No gender difference with regard to creativity is found in terms of the frequency of response to the items. Most research evidence clearly indicates the gender response differences in the science learning setting as well as in the creativity setting. In this study, however, when responses are compared by gender, differences were not found. Perhaps this is unique to this creativity research. We have no explanation for this point but it certainly is worthy of further study.

Lastly, we need to address one more important thing and that is the need for development of a new type of creativity test instrument which can be used with multi- or cross-cultural populations. we faced several kinds of problems through the process of this investigation. The problems are not simply linguistic ones, but cultural ones as well. For example, is an unlabeled object like a door key used in the instrument really the same stimulus to both American and Japanese children? The popular image of door key may have different connotations in each culture. We can compare the responses of the subjects only when the stimulus is equal for the whole population concerned. If the problems we faced in this cross-cultural study are universal, they are true for research focusing on only American populations because of its multi-cultural nature. In that case, most findings on the creativity of American children so far may need to be carefully reexamined because cultural bias in the stimuli may not have been taken into consideration during the developing process of the creativity test instruments.

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